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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Patent Counsel  
APPLIED MATERIALS, INC.  
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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 08/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/786,424

Applicant(s)

COLLINS ET AL.

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the portion connecting the lower cylindrical portion and the ceiling extending inward from the cylindrical portion where the portion extends inward having a radius of curvature must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

Claims 10 and 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 10 and 26 are indefinite because it is unclear how the configuration can be "cylindrical" with the claims requiring a "conical" configuration.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

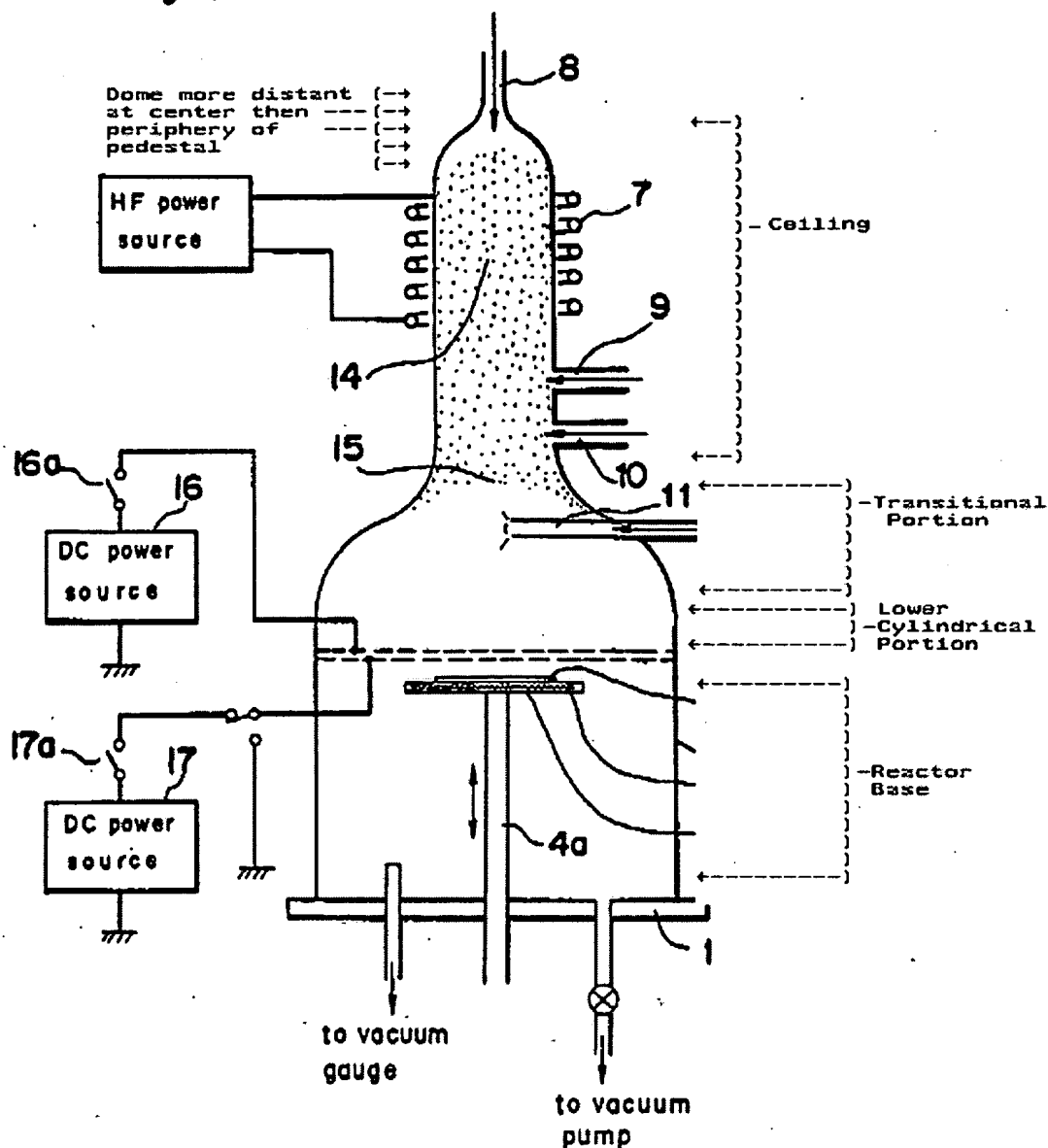
This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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Claims 1, 2, 10, 11, 15, 22, 23, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hotomi (U.S. Pat. 4,828,369) in view of Yoshihiro (Japan 06-196446) and Inman (GB 0169 744).

Regarding Claims 1, 2, 10, 11, 22, 23, 25 and 26, Hotomi teach in Fig. 2 a plasma chamber. (See Fig. 2) The plasma chamber includes a pedestal 4, which is adapted to hold a workpiece 3 to be processed. (Column 9 lines 65-68) A reactor base including base plate 1 houses the pedestal. (Column 9 lines 60-61; the reactor base includes the area between the grid and the base plate 1.) A high-frequency coil 7 is arranged adjacent the reactor and inductively couples power into the reactor. (Column 10 lines 11-17) The plasma chamber enclosure structure includes a bell jar 2. (Column 10 lines 60-64) The bell jar 2 is single walled. (See Fig. 2) The enclosure structure is inverted cup shape in configuration. (See Fig. 2) The plasma chamber structure includes a ceiling. (See Figure 2) The plasma chamber enclosure has a central gas inlet 8. (Column 10 lines 18-19) The plasma structure has a sidewall. (Fig. 2) The plasma enclosure has a lower cylindrical portion generally transverse to the pedestal. (Fig. 2) There is a transitional portion between the lower cylindrical portion and the ceiling. The transitional portion extends inwardly from the lower cylindrical portion and comprises a radius of curvature. (See Fig. 2) See Annotated Figure below.

**Fig. 2**



The plasma chamber enclosure structure covers the base. (See Figure 2) A plasma processing volume is 14, 15 defines a plasma-processing volume over the pedestal. (Column 11 lines 68; Column 12 lines 1-5) The plasma chamber enclosure is capable of transmitting inductive power through the enclosure from an antenna. (Column 10 lines 12-17)

The differences between Hotomi and the present claims are that the flattened conical configuration of the ceiling is not discussed, the plasma chamber enclosure structure being formed of a dielectric material of silicon, silicon carbide, quartz or

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alumina is not discussed and the flange portion extending radially outward from the side wall.

Regarding the limitation of the conical configuration, Yoshihiro teach a plasma chamber with a truncated conical configuration for a chamber ceiling. (See Abstract and Machine translation paragraph 11) In Figure 1 the chamber ceiling has a flat portion that extend to the gas inlet 2 such that the ceiling is more distant to the pedestal center 11 than at its periphery. (Figure 1)

The motivation for utilizing a truncated conical configuration for the ceiling is that it allows preventing damage to a wafer surface. (See Abstract)

Regarding the limitation of the quartz material, Inman et al. teach in Fig. 1 an ion source comprising a chamber 1 the wall 2 made of quartz. In the wall 2 are a first port 3 by means of which the chamber 3 can be evacuated, and a second port 4 by means of which a volatile or gaseous material, ions which are to be provided by the source, can be intruded into the chamber 1. Surrounding the chamber 1 is a coil 5 through which an electric current can be passed from a radio-frequency power source 6 of a known type. (Page 2 lines 24-27; Page 3 lines 1-5)

The motivation for utilizing a quartz bell jar in a plasma apparatus is that it allows for enhancing the number of atomic ions produced by the heating effect of the wall to the plasma. (Page 4 lines 1-10)

Regarding the limitation of the flange extending radially from the sidewall, in Fig. 1 of Inman et al. a radially extending flange is shown. (See Figure 1)

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The motivation for providing a flange is that it allows attachment to a chamber.

(See Page 4 lines 22-28)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Hotomi by utilizing a truncated conical ceiling as taught by Yoshihiro and to have utilized a quartz material for the plasma chamber and radial extending flange as taught by Inman et al. because it allows for preventing damage to the wafer surface and enhancing the number of atomic ions produced by the heating effect of the wall to the plasma.

Claims 3-5, 13, 14, 17, 18, 24, 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hotomi in view of Yoshihiro and Inman et al. as applied to claims 1, 2, 10, 11, 15, 22, 23, 25 and 26 above, and further in view of Smith (U.S. Pat. 5,142,198).

The difference not yet discussed is the use of an alumina enclosure.

Smith teach a dome shaped dielectric bell jar where reactive gases can be introduced and plasma produced through an RF generator means. (Column 2 lines 45-56) The dielectric bell jar is preferably made of quartz or alumina. (Column 4 lines 3-6)

The motivation for utilizing an alumina bell jar is that it allows for reducing the wall effects in the chamber. (Column 2 lines 34-36)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized an enclosure made of alumina as taught by Smith because it allows for reducing the wall effects of the chamber.



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Claims 6, 12 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hotomi in view of Yoshihiro and Inman et al. as applied to claims 1, 2, 10, 11, 15, 22, 23, 25 and 26 above, and further in view of Reuschel (U.S. Pat. 4,023,520).

The difference not yet discussed is the use of silicon for the chamber enclosure.

As previously discussed Hotomi teach utilization of a bell jar for a plasma chamber for a reactive process such as reactive plasma polymerization. (See Hotomi discussed above) Reuschel teach that an entire reaction container such as a bell jar can be composed of pure silicon. (Column 2 lines 9-11)

The motivation for utilizing a bell jar composed of pure silicon as a reaction chamber is that it is able to withstand high heat and ensure that pure deposits of silicon. (Column 1 lines 56-60; Column 1 lines 65-68)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a bell jar made of silicon as taught by Reuschel because it allows for a chamber that withstands high heat and ensures pure deposits of silicon.

Claims 7-9, 19-21, and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hotomi in view of Yoshihiro and Inman et al. as applied to claims 1, 2, 10, 11, 15, 22, 23, 25 and 26 above, and further in view of Degner et al. (U.S. Pat. 5,074,456).

The differences not yet discussed is the use of a conductive ceiling portion in facing relationship to the pedestal when positioned over the base, the ceiling being

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biased is not discussed, the use of a ceiling being a conductive material and is adapted to be coupled to a bias power source.

As has already been discussed above in Inman et al. a reactor enclosure can be made of quartz. (See Inman et al. discussed) Degner et al. teach a plate in facing relationship to a pedestal. (See Fig. 3) The plate will provide an electrode surface 10, which is exposed to the plasma in the parallel plate or other reactor. The plate will be composed of a semiconductor pure material. (Column 3 lines 65-68) Examples of material include quartz. (Column 4 lines 12) The system 50 of Fig. 3 includes an RF power source 78 for supplying the necessary excitation voltage to the electrode assembly 10 and lower electrode 58. (Column 7 lines 48-51) The electrodes can be "domed ". (Column 4 lines 59-65)

The motivation utilizing a conductive ceiling portion and applying a bias to the ceiling portion is that it allows for the use of an electrode that has desirable electrical and thermal properties that are compatible with many or all plasma chemistries. (Column 2 lines 22-24)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have recognized that the quartz bell jar of Inman et al. is conductive in the plasma and to have applied a bias to the quartz bell jar material since Degner et al. recognize that quartz domed materials are conductive and should have an RF potential applied to it because such electrodes possess desirable electrical and thermal properties that are compatible with many or all plasma chemistries.

***Response to Arguments***

Applicant's arguments filed 8-17-05 have been fully considered but they are not persuasive.

***DRAWINGS***

Applicant has removed the terminology of "transitional" and "transition" to try to overcome the Examiner's objection to the drawings. However the Examiner maintains that the portion connecting the lower cylindrical portion and the ceiling extending inward from the cylindrical portion where the portion extends inward having a radius of curvature is not shown. The Examiner requests that this be shown in the drawings or pointed out in the Drawings. The drawing in Applicant's specification that has a flattened conical configuration is shown in Fig. 4E.

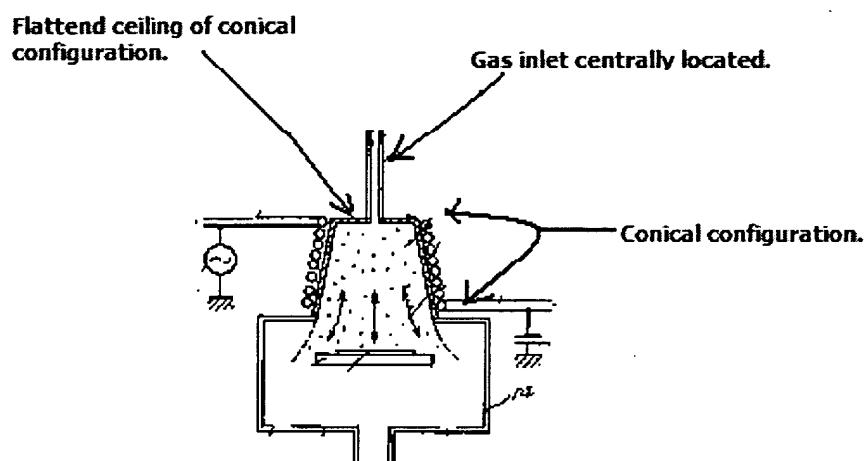
***35 U.S.C. 112 REJECTIONS***

Applicant has argued that the terms "generally right circular cylindrical configuration" in claims 10 and 26 do not conflict with the claims from which they depend. However the Examiner still believes that there is conflict between the claimed terminology. Specifically, claims 10 and 26 require that the "enclosure structure has a generally right circular cylindrical configuration". Claims 1 and 22 require the enclosure structure to have a cylindrical portion and a flattened conical portion. It is believed that clarifying the lower cylindrical portion to have the right circular configuration would clear up the conflict.

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**35 U.S.C. 103 REJECTIONS**

In response to the argument that the Examiner has failed to show that the prior art does not teach "a flattened conical configuration extending to the gas inlet", it is argued that Yoshihiro do teach a conical configuration where the cone is flattened and extends to the gas inlet.



As seen above Yoshihiro teach a truncated cone having a flat portion where the flat portion of the cone extends to the central gas inlet. Hotomi teach applicant's required lower cylindrical portion, a portion that connects the cylindrical portion to the ceiling and the portion having a radius. Yoshihiro teach truncating the ceiling to have a flat portion. (See Hotomi discussed above and Yoshihiro discussed above)

**OBVIOUSNESS TYPE DOUBLE PATENTING REJECTIONS**

The obviousness type double patenting rejections have been overcome by Applicant's filing of a Terminal Disclaimer.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
August 25, 2005